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DRINKING WATER SURVEILLANCE PROGRAM

METRO TORONTO (R.C. HARRIS) WATER TREATMENT PLANT

ANNUAL REPORT 1990

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METRO TORONTO (R.C. HARRIS) WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1990

HAZARDOUS CONTAMINANTS
COORDINATION BRANCH
135 ST. CLAIR AVENUE WEST
TORONTO, ONTARIO M4V 1P5

SEPTEMBER 1992

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

METRO TORONTO (R.C. HARRIS) WATER TREATMENT PLANT
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Metro Toronto (R.C. Harris) water treatment plant is a conventional treatment plant which treats water from Lake Ontario. The process consists of coagulation, flocculation, sedimentation, filtration, fluoridation and disinfection. Ammonia is used in the disinfection process to convert free chlorine to a combined (chloramine) residual and sulphur dioxide is used to remove the excess chlorine. This plant has a design capacity of 1000.0 x 1000 m^3/day. The Metro Toronto (R.C. Harris) water treatment plant, in conjunction with the other Metro Toronto water plants, serves a population of approximately 2,333,300.

Raw and treated water at the plant was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Metro Toronto (R.C. Harris) water treatment plant, for the sample year 1990, produced good quality water. Water from the distribution system was not sampled.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP)

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE

A '.' INDICATES THAT NO SAMPLE WAS TAKEN

	SITE	RAW			TREATED	
SCAN	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	18	14	77	6	1	16
CHEMISTRY (FLD)	18	18	100	36	36	100
CHEMISTRY (LAB)	132	109	82	132	101	76
METALS	144	58	40	144	38	26
CHLOROAROMATICS	84	0	0	84	0	0
CHLOROPHENOLS	12	0	0	12	0	0
PAH	66	0	0	66	0	0
PESTICIDES & PCB	204	0	0	204	0	0
PHENOLICS	6	0	0	6	0	0
SPECIFIC PESTICIDES	50	0	0	50	0	0
VOLATILES	145	0	0	174	24	13
TOTAL	879	199		914	200	

DRINKING WATER SURVEILLANCE PROGRAM

METRO TORONTO (R.C. HARRIS) WATER TREATMENT PLANT
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Metro Toronto (R.C. Harris) water treatment plant in the spring of 1986. Previous annual reports have been published for 1986, 1987, 1988 and 1989.

PLANT DESCRIPTION

The Metro Toronto (R.C. Harris) water treatment plant is a conventional treatment plant which treats water from Lake Ontario. The process consists of coagulation, flocculation, sedimentation, filtration, fluoridation and disinfection. Ammonia is used in the disinfection process to convert free chlorine to a combined (chloramine) residual and sulphur dioxide is used to remove the excess chlorine. This plant has a design capacity of 1000.0 x 1000 m^3/day. The Metro Toronto (R.C. Harris) water treatment plant, in conjunction with the other Metro Toronto water plants, serves a population of approximately 2,333,300.

The sample day flows ranged from 442.6 x 1000 m^3/day to 706.6 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service

connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the

level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated water. No results were reported above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance

organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system, due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 1 of 6 treated water samples with a maximum reported value of 15.5°C.

CHEMISTRY (LAB)

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in the 6 treated water samples with a maximum reported value of 139.0 mg/L.

Total ammonium exceeded the European Economic Community Aesthetic Guideline Level of 0.05 mg/L in 5 of 6 treated water samples with a maximum reported value of 0.17 mg/L. Ammonia is added to the disinfection process to convert free chlorine to a combined (chloramine) residual. It is not unexpected that ammonia levels were slightly elevated.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 1 of 6 treated water samples. The exceedance occurred in July at 240.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticide scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results reported above trace levels.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 6 treated water samples analyzed with a maximum level of 19.8 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The Metro Toronto (R.C. Harris) water treatment plant, for the sample year 1990, produced good quality water.

No known health related guidelines were exceeded.

FIGURE 1

METRO TORONTO (R.C. HARRIS) WATER TREATMENT PLANT

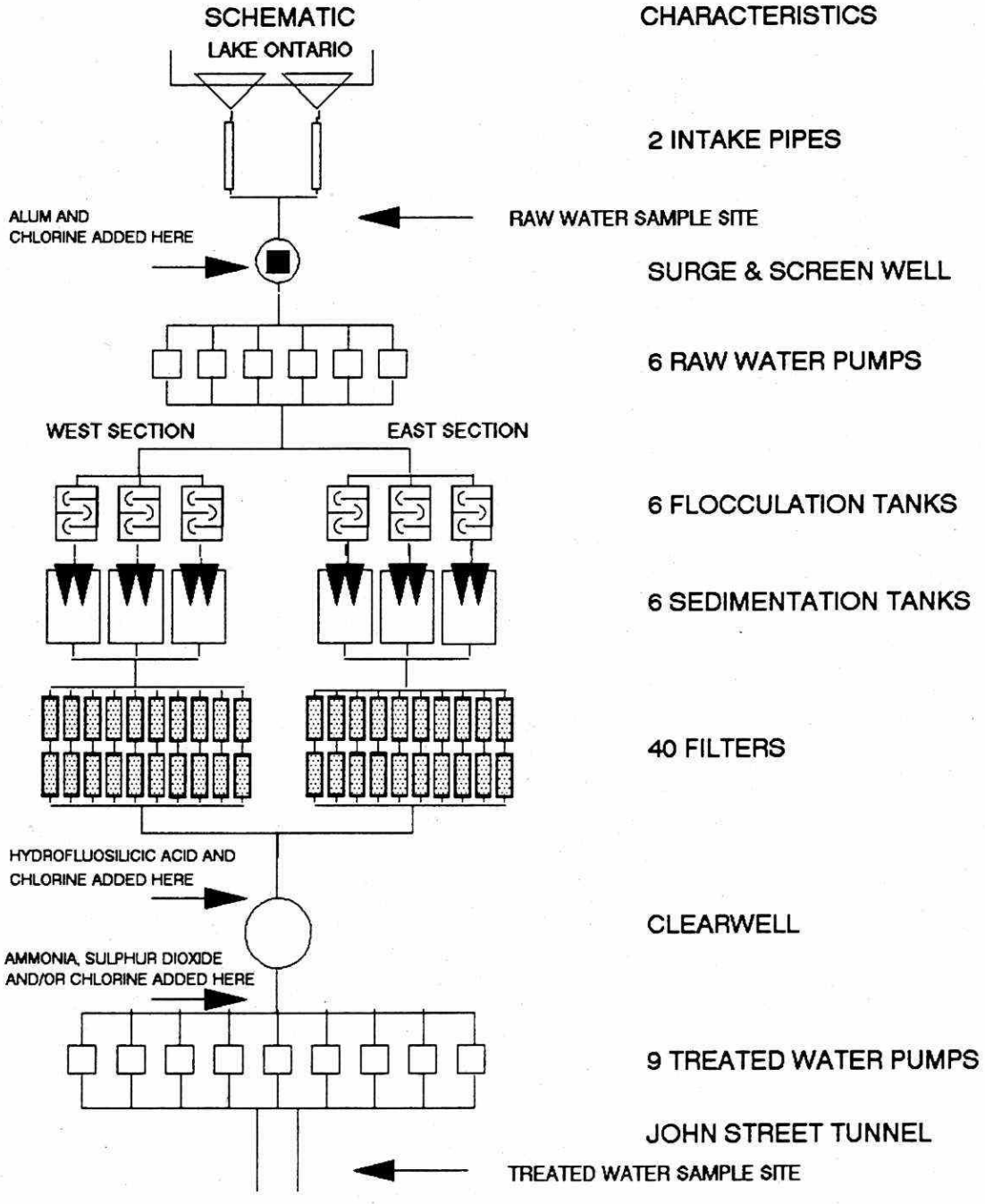

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #:	220002262
PLANT NAME:	METRO TORONTO (R.C. HARRIS) WTP
DISTRICT:	TORONTO EAST
REGION:	CENTRAL
DISTRICT OFFICER:	D. HOGG
UTM #:	176405404836260
PLANT SUPERINTENDENT:	A. MOORE
ADDRESS:	2701 QUEEN ST. E., TORONTO,ONT. M4E 1J1 (416)392-2932
MUNICIPALITY:	METRO TORONTO
AUTHORITY:	MUNICIPAL

PLANT INFORMATION

PLANT VOLUME:	-	(X 1000 M3)
DESIGN CAPACITY:	1000.000	(X 1000 M3/DAY)
RATED CAPACITY:	-	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
BOROUGH OF EAST YORK	97,679
CITY OF ETOBICOKE	298,490
CITY OF NORTH YORK	556,308
CITY OF SCARBOROUGH	461,957
CITY OF TORONTO	615,000
CITY OF YORK	133,856
REGION OF YORK(SOUTH)	170,000

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
ALUMINUM	HIGHLIFT DISCHARGE	DAILY READING
FREE CHLORINE RESIDUAL	AFTER DISINFECTION	CONTINUOUS
	AFTER FILTERS	CONTINUOUS
	CHLORINE EFFLUENT	CONTINUOUS
	AFTER DECHLORINATION	CONTINUOUS
	RAW WATER EFFLUENT	
TOTAL CHLORINE RESIDUAL	HIGHLIFT DISCHARGE	CONTINUOUS
FLUORIDE	HIGHLIFT DISCHARGE	EVERY 4 HOURS
AMMONIA TEST	HIGHLIFT DISCHARGE	EVERY 8 HOURS
	CHLORINE EFFLUENT	EVERY 8 HOURS
	RAW WATER	2HRLY
	AFTER SETTLING TANKS	2HRLY
PH	TREATED WATER IN LAB	DAILY
	AFTER DISINFECTION	DAILY
	SETTLED WATER IN LAB	DAILY
	RAW WATER	CONTINUOUS
TASTE & ODOUR	HIGHLIFT DISCHARGE	HOURLY READING
	CHLORINE EFFLUENT	HOURLY READING
TEMPERATURE	RAW WATER	CONTINUOUS
TURBIDITY	AFTER FILTERS	CONTINUOUS
	HIGHLIFT DISCHARGE	CONTINUOUS
	RAW WATER	CONTINUOUS
	AFTER SETTLING TANKS	CONTINUOUS

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) SAMPLE DAY CONDITIO 1990

DATE	DELAY * TIME(HRS)	FLOW (1000M3)	TREATMENT CHEMICAL DOSAGE (MG/L) COAGULATION ALUM LIQUID	PRE CHLORINATION CHLORINE	FLUORIDATION HYDROFLUOSILICIC ACI	POST CHLORINATION CHLORINE	DECHLORINATION SULPHUR DIOXIDE	CHLORAMINATION ANHYDROUS AMMONIA
JAN 15	8.70	655.000	5.00	1.00	1.08	1.40	1.20	.16
MAR 19	8.45	650.000	3.00	1.00	1.07	1.10	.70	.17
MAY 22	11.52	480.000	7.00	1.00	1.22	.60	.50	.17
JUL 16	12.53	442.580	7.00	1.00	1.08	.60	.40	.14
SEP 17	11.26	506.000	7.00	1.00	1.18	1.20	.80	.16
NOV 19	8.04	706.600	3.00	1.00	1.10	1.20	.90	.18

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL						
FECAL COLIFORM MF	6	3	0	.	.	.
STANDRD PLATE CNT MF	.	.	.	6	1	0
TOTAL COLIFORM MF	6	5	0	.	.	.
T COLIFORM BCKGRD MF	6	6	0	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	18	14	0	6	1	0
CHEMISTRY (FLD)						
FLD CHLORINE (COMB)	.	.	.	6	6	0
FLD CHLORINE FREE	.	.	.	6	6	0
FLD CHLORINE (TOTAL)	.	.	.	6	6	0
FLD PH	6	6	0	6	6	0
FLD TEMPERATURE	6	6	0	6	6	0
FLD TURBIDITY	6	6	0	6	6	0
*TOTAL SCAN CHEMISTRY (FLD)	18	18	0	36	36	0
CHEMISTRY (LAB)						
ALKALINITY	6	6	0	6	6	0
CALCIUM	6	6	0	6	6	0
CYANIDE	6	0	0	6	0	0
CHLORIDE	6	6	0	6	6	0
COLOUR	6	1	5	6	0	5
CONDUCTIVITY	6	6	0	6	6	0
DISS ORG CARBON	6	6	0	6	6	0
FLUORIDE	6	6	0	6	6	0
HARDNESS	6	6	0	6	6	0
IONCAL	6	6	0	6	6	0
LANGELIERS INDEX	6	6	0	6	6	0
MAGNESIUM	6	6	0	6	6	0
SODIUM	6	6	0	6	6	0
AMMONIUM TOTAL	6	5	0	6	5	1
NITRITE	6	3	3	6	1	3
TOTAL NITRATES	6	6	0	6	6	0
NITROGEN TOT KJELD	6	6	0	6	6	0
PH	6	6	0	6	6	0
PHOSPHORUS FIL REACT	6	2	3	6	0	4
PHOSPHORUS TOTAL	6	2	4	6	0	4
SULPHATE	6	6	0	6	6	0
TURBIDITY	6	6	0	6	5	1
*TOTAL SCAN CHEMISTRY (LAB)	132	109	15	132	101	18

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS						
SILVER	6	0	0	6	0	1
ALUMINUM	6	6	0	6	6	0
ARSENIC	6	1	5	6	1	5
BARIUM	6	6	0	6	6	0
BORON	6	6	0	6	6	0
BERYLLIUM	6	0	2	6	0	0
CADMIUM	6	0	0	6	0	0
COBALT	6	0	6	6	0	5
CHROMIUM	6	0	6	6	0	5
COPPER	6	6	0	6	0	6
IRON	6	1	5	6	0	0
MERCURY	6	0	0	6	0	0
MANGANESE	6	6	0	6	2	4
MOLYBDENUM	6	6	0	6	6	0
NICKEL	6	0	5	6	0	5
LEAD	6	2	4	6	0	6
ANTIMONY	6	4	2	6	3	3
SELENIUM	6	0	3	6	0	1
STRONTIUM	6	6	0	6	6	0
TITANIUM	6	3	3	6	2	4
THALLIUM	6	0	0	6	0	1
URANIUM	6	0	6	6	0	6
VANADIUM	6	0	6	6	0	6
ZINC	6	5	1	6	0	6
*TOTAL SCAN METALS	144	58	54	144	38	64
*TOTAL GROUP INORGANIC & PHYSICAL	294	185	69	312	175	82
CHLOROAROMATICS						
HEXACHLOROBUTADIENE	6	0	0	6	0	0
123 TRICHLOROBENZENE	6	0	0	6	0	0
1234 T-CHLOROBENZENE	6	0	0	6	0	0
1235 T-CHLOROBENZENE	6	0	0	6	0	0
124 TRICHLOROBENZENE	6	0	0	6	0	0
1245 T-CHLOROBENZENE	6	0	0	6	0	0
135 TRICHLOROBENZENE	6	0	0	6	0	0
HCB	6	0	0	6	0	0
HEXACHLOROETHANE	6	0	0	6	0	1
OCTACHLOROSTYRENE	6	0	0	6	0	0
PENTACHLOROBENZENE	6	0	0	6	0	0
236 TRICHLOROTOLUENE	6	0	0	6	0	0
245 TRICHLOROTOLUENE	6	0	0	6	0	0
26A TRICHLOROTOLUENE	6	0	0	6	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	0	84	0	1

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROPHENOLS						
234 TRICHLOROPHENOL	2	0	0	2	0	0
2345 T-CHLOROPHENOL	2	0	0	2	0	0
2356 T-CHLOROPHENOL	2	0	0	2	0	0
245-TRICHLOROPHENOL	2	0	0	2	0	0
246-TRICHLOROPHENOL	2	0	0	2	0	0
PENTACHLOROPHENOL	2	0	0	2	0	0
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0
PAH						
PHENANTHRENE	4	0	0	4	0	0
ANTHRACENE	3	0	0	3	0	0
FLUORANTHENE	4	0	0	4	0	0
PYRENE	4	0	0	4	0	0
BENZO(A)ANTHRACENE	4	0	0	4	0	0
CHRYSENE	4	0	0	4	0	0
DIMETH. BENZ(A)ANTHR	3	0	0	3	0	0
BENZO(E) PYRENE	4	0	0	4	0	0
BENZO(B) FLUORANTHEN	4	0	0	4	0	0
PERYLENE	4	0	0	4	0	0
BENZO(K) FLUORANTHEN	4	0	0	4	0	0
BENZO(A) PYRENE	4	0	0	4	0	0
BENZO(G,H,I) PERYLEN	4	0	0	4	0	0
DIBENZO(A,H) ANTHRAC	4	0	0	4	0	0
INDENO(1,2,3-C,D) PY	4	0	0	4	0	0
BENZO(B) CHRYSENE	4	0	0	4	0	0
CORONENE	4	0	0	4	0	0
*TOTAL SCAN PAH	66	0	0	66	0	0
PESTICIDES & PCB						
ALDRIN	6	0	0	6	0	0
ALPHA BHC	6	0	6	6	0	5
BETA BHC	6	0	0	6	0	0
LINDANE	6	0	0	6	0	0
ALPHA CHLORDANE	6	0	0	6	0	0
GAMMA CHLORDANE	6	0	0	6	0	0
DIELDRIN	6	0	0	6	0	0
METHOXYCHLOR	6	0	0	6	0	0
ENDOSULFAN 1	6	0	0	6	0	0
ENDOSULFAN II	6	0	0	6	0	0
ENDRIN	6	0	0	6	0	0
ENDOSULFAN SULPHATE	6	0	0	6	0	0
HEPTACHLOR EPOXIDE	6	0	0	6	0	0
HEPTACHLOR	6	0	0	6	0	0
MIREX	6	0	0	6	0	0
OXYCHLORDANE	6	0	0	6	0	0
OPDDT	6	0	0	6	0	0
PCB	6	0	0	6	0	0
DDD	6	0	0	6	0	0
PPDDE	6	0	0	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	6	0	0	6	0	0
AMETRINE	6	0	0	6	0	0
ATRAZINE	6	0	2	6	0	2
ATRATONE	6	0	0	6	0	0
CYANAZINE (BLADEX)	6	0	0	6	0	0
DESETHYLATRAZINE	6	0	0	6	0	0
D-ETHYL SIMAZINE	5	0	0	5	0	0
PROMETONE	6	0	0	6	0	0
PROPAZINE	6	0	0	6	0	0
PROMETRYNE	6	0	0	6	0	0
METRIBUZIN (SENCOR)	6	0	0	6	0	0
SIMAZINE	6	0	0	6	0	0
ALACHLOR (LASSO)	6	0	0	6	0	0
METOLACHLOR	6	0	0	6	0	0
HEXACLCYCLOPENTADIEN	1	0	0	1	0	0
*TOTAL SCAN PESTICIDES & PCB	204	0	8	204	0	7
PHENOLICS						
PHENOLICS	6	0	3	6	0	4
*TOTAL SCAN PHENOLICS	6	0	3	6	0	4
SPECIFIC PESTICIDES						
TOXAPHENE	6	0	0	6	0	0
2,4,5-T	2	0	0	2	0	0
2,4-D	2	0	0	2	0	0
2,4-DB	2	0	0	2	0	0
2,4 D PROPIONIC ACID	2	0	0	2	0	0
DICAMBA	2	0	0	2	0	0
PICHLORAM	0	0	0	0	0	0
SILVEX	2	0	0	2	0	0
DIAZINON	2	0	0	2	0	0
DICHLOROVOS	2	0	0	2	0	0
CHLORPYRIFOS	2	0	0	2	0	0
ETHION	2	0	0	2	0	0
AZINPHOS-METHYL	0	0	0	0	0	0
MALATHION	2	0	0	2	0	0
MEVINPHOS	2	0	0	2	0	0
METHYL PARATHION	2	0	0	2	0	0
METHYLTRITHION	2	0	0	2	0	0
PARATHION	2	0	0	2	0	0
PHORATE	2	0	0	2	0	0
RELDAN	2	0	0	2	0	0
RONNEL	2	0	0	2	0	0
AMINOCARB	0	0	0	0	0	0
BENONYL	0	0	0	0	0	0
BUX	0	0	0	0	0	0
CARBOFURAN	1	0	0	1	0	0
CICP	1	0	0	1	0	0
DIALLATE	1	0	0	1	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	1	0	0	1	0	0
IPC	1	0	0	1	0	0
PROPOXUR	1	0	0	1	0	0
CARBARYL	1	0	0	1	0	0
BUTYLATE	1	0	0	1	0	0
*TOTAL SCAN SPECIFIC PESTICIDES	50	0	0	50	0	0
VOLATILES						
BENZENE	5	0	0	6	0	1
TOLUENE	5	0	0	6	0	2
ETHYLBENZENE	5	0	2	6	0	4
P-XYLENE	5	0	0	6	0	0
M-XYLENE	5	0	0	6	0	0
O-XYLENE	5	0	0	6	0	1
STYRENE	5	0	4	6	0	5
1,1 DICHLOROETHYLENE	5	0	0	6	0	0
METHYLENE CHLORIDE	5	0	0	6	0	0
T1,2DICHLOROETHYLENE	5	0	0	6	0	0
1,1 DICHLOROETHANE	5	0	0	6	0	0
CHLOROFORM	5	0	0	6	6	0
111, TRICHLOROETHANE	5	0	0	6	0	0
1,2 DICHLOROETHANE	5	0	0	6	0	0
CARBON TETRACHLORIDE	5	0	0	6	0	0
1,2 DICHLOROPROPANE	5	0	0	6	0	0
TRICHLOROETHYLENE	5	0	0	6	0	0
DICHLOROBROMOMETHANE	5	0	0	6	6	0
112 TRICHLOROETHANE	5	0	0	6	0	0
CHLORODIBROMOMETHANE	5	0	0	6	6	0
T-CHLOROETHYLENE	5	0	0	6	0	0
BROMOFORM	5	0	0	6	0	6
1122 T-CHLOROETHANE	5	0	0	6	0	0
CHLOROBENZENE	5	0	0	6	0	0
1,4 DICHLOROBENZENE	5	0	0	6	0	1
1,3 DICHLOROBENZENE	5	0	0	6	0	0
1,2 DICHLOROBENZENE	5	0	0	6	0	0
ETHLYENE DIBROMIDE	5	0	0	6	0	0
TOTL TRIHALOMETHANES	5	0	0	6	6	0
*TOTAL SCAN VOLATILES	145	0	6	174	24	20
*TOTAL GROUP ORGANIC	567	0	17	596	24	32

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
- 1. Maximum Acceptable Concentration (MAC)
- 1+. MAC for Total Trihalomethanes
- 2. Interim Maximum Acceptable Concentration (IMAC)
- 3. Aesthetic Objective (AO)
- 3*. AO for Total Xylenes
- 4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
- 1. Maximum Acceptable Concentration (MAC)
- 2. Proposed MAC
- 3. Interim MAC
- 4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
- 1. Guideline Value (GV)
- 2. Tentative GV
- 3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
- 1. Maximum Contaminant Level (MCL)
- 2. Suggested No-Adverse Effect Level (SNAEL)
- 3. Lifetime Health Advisory
- 4. EPA Ambient Water Quality Criteria
- 4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
- 1. Health Related Guideline Level
- 2. Aesthetic Guideline Level
- 3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminate Interference
XP	Positive After X Number Of Hours
T#	(T06) Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
BACTERIOLOGICAL			
FECAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0	GUIDELINE = 0 (A1)
JAN	0	.	
MAR	9	.	
MAY	BDL	.	
JUL	0	.	
SEP	7	.	
NOV	2	.	
STANDRD PLATE CNT MF (COUNT/ML)		DET'N LIMIT = 0	GUIDELINE = 500/ML (A3)
JAN	.	1 <=>	
MAR	.	25	
MAY	.	0 <=>	
JUL	.	3 <=>	
SEP	.	3 <=>	
NOV	.	0 <=>	
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0	GUIDELINE = 5/100ML(A1)
JAN	56	.	
MAR	156	.	
MAY	BDL	.	
JUL	4	.	
SEP	20	.	
NOV	10	.	
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0	GUIDELINE = N/A
JAN	376	.	
MAR	660	.	
MAY	270	.	
JUL	276	.	
SEP	2040	.	
NOV	77	.	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
CHEMISTRY (FLD)				
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	.610		
MAR	.	.650		
MAY	.	.400		
JUL	.	.680		
SEP	.	.500		
NOV	.	.550		
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	.070		
MAR	.	.100		
MAY	.	.300		
JUL	.	.080		
SEP	.	.230		
NOV	.	.150		
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	.680		
MAR	.	.750		
MAY	.	.700		
JUL	.	.760		
SEP	.	.730		
NOV	.	.700		
FLD PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
JAN	8.100	7.600		
MAR	8.200	7.560		
MAY	8.300	7.540		
JUL	8.500	7.670		
SEP	8.100	7.500		
NOV	8.100	7.650		
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A3)
JAN	2.000	2.500		
MAR	3.000	3.500		
MAY	6.000	6.500		
JUL	16.000	15.500		
SEP	15.000	12.500		
NOV	6.500	6.000		
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A	GUIDELINE = 1 (A1)
JAN	2.500	.150		
MAR	1.600	.100		
MAY	.640	.070		
JUL	.480	.090		
SEP	.930	.090		
NOV	.680	.130		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
CHEMISTRY (LAB)				
ALKALINITY (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 30-500 (A3)
JAN	102.700	93.700		
MAR	101.500	93.000		
MAY	100.100	91.700		
JUL	100.700	91.300		
SEP	94.600	87.200		
NOV	102.700	96.300		
CALCIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 100 (F2)
JAN	41.200	41.600		
MAR	39.800	40.000		
MAY	42.400	41.600		
JUL	42.400	41.900		
SEP	38.800	39.600		
NOV	39.600	40.400		
CHLORIDE (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 250 (A3)
JAN	25.300	26.800		
MAR	24.900	27.300		
MAY	22.600	24.300		
JUL	22.900	24.700		
SEP	22.000	24.500		
NOV	21.900	24.700		
COLOUR (HZU)			DET'N LIMIT = 0.5	GUIDELINE = 5 (A3)
JAN	1.500 <T	.500 <T		
MAR	.500 <T	.500 <T		
MAY	2.000 <T	1.000 <T		
JUL	.500 <T	.500 <T		
SEP	1.000 <T	1.000 <T		
NOV	4.500	BDL		
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.	GUIDELINE = 400 (F2)
JAN	340	343		
MAR	337	340		
MAY	324	329		
JUL	320	324		
SEP	308	321		
NOV	331	339		
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)
JAN	1.900	1.800		
MAR	1.800	1.700		
MAY	1.800	1.500		
JUL	2.000	1.800		
SEP	2.000	1.700		
NOV	1.800	1.700		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
FLUORIDE (MG/L)			DET'N LIMIT = 0.01	GUIDELINE = 2.4 (A1)
JAN	.120	1.240		
MAR	.140	1.300		
MAY	.120	1.120		
JUL	.140	1.160		
SEP	.140	1.080		
NOV	.120	1.180		
HARDNESS (MG/L)			DET'N LIMIT = 0.5	GUIDELINE = 80-100 (A4)
JAN	139.000	139.000		
MAR	135.000	136.000		
MAY	143.000	139.000		
JUL	139.900	138.900		
SEP	133.000	135.000		
NOV	135.000	136.000		
IONCAL (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
JAN	1.335	3.288		
MAR	.722	1.497		
MAY	5.188	3.447		
JUL	2.980	3.685		
SEP	2.499	2.877		
NOV	.738	.068		
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
JAN	.501	.285		
MAR	.531	.335		
MAY	.374	.257		
JUL	.557	.339		
SEP	.323	.015		
NOV	.595	.475		
MAGNESIUM (MG/L)			DET'N LIMIT = 0.1	GUIDELINE = 30 (F2)
JAN	8.800	8.700		
MAR	8.600	8.600		
MAY	9.100	8.500		
JUL	8.300	8.350		
SEP	8.800	8.700		
NOV	8.700	8.500		
SODIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 200 (A4)
JAN	14.200	13.800		
MAR	13.600	13.800		
MAY	12.000	12.200		
JUL	12.200	12.200		
SEP	11.400	11.600		
NOV	12.600	12.400		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = 0.05 (F2)
JAN	BDL	.098		
MAR	.036	.126		
MAY	.014	.006 <T		
JUL	.022	.052		
SEP	.036	.086		
NOV	.020	.168		
NITRITE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)
JAN	.001 <T	BDL		
MAR	.004 <T	BDL		
MAY	.002 <T	.002 <T		
JUL	.008	.005		
SEP	.007	.004 <T		
NOV	..005	.002 <T		
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)
JAN	.405	.395		
MAR	.395	.395		
MAY	.340	.330		
JUL	.255	.260		
SEP	.245	.315		
NOV	.385	.385		
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A
JAN	.230	.270		
MAR	.270	.290		
MAY	.250	.260		
JUL	.250	.230		
SEP	.270	.250		
NOV	.190	.280		
PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
JAN	8.320	8.140		
MAR	8.370	8.210		
MAY	8.190	8.120		
JUL	8.370	8.200		
SEP	8.200	7.920		
NOV	8.430	8.330		
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = 0.0005	GUIDELINE = N/A
JAN	.001 <T	.001 <T		
MAR	.002	.001 <T		
MAY	.002	.001 <T		
JUL	.001 <T	BDL		
SEP	BDL	BDL		
NOV	.000 <T	.001 <T		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED		
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = .40 (F2)
JAN	.013	.004 <T		
MAR	.016	.008 <T		
MAY	.009 <T	.002 <T		
JUL	.007 <T	BDL		
SEP	.007 <T	BDL		
NOV	.007 <T	.003 <T		
SULPHATE (MG/L)			DET'N LIMIT = .200	GUIDELINE = 500 (A3)
JAN	26.710	30.400		
MAR	26.440	29.100		
MAY	26.750	31.390		
JUL	26.700	31.380		
SEP	26.500	31.520		
NOV	27.150	29.700		
TURBIDITY (FTU)			DET'N LIMIT = 0.05	GUIDELINE = 1 (A1)
JAN	3.800	.450		
MAR	2.400	.470		
MAY	1.180	.180		
JUL	.690	.400		
SEP	1.300	.220 <T		
NOV	1.000	.380		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
METALS				
SILVER (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A1)
JAN	BDL	BDL		
MAR	BDL	BDL		
MAY	BDL	BDL		
JUL	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	.080 <T		
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)
JAN	35.000	80.000		
MAR	48.000	81.000		
MAY	13.000	100.000		
JUL	6.600	240.000		
SEP	4.300	95.000		
NOV	11.000	100.000		
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)
JAN	.720 <T	.930 <T		
MAR	.830 <T	.580 <T		
MAY	.880 <T	.710 <T		
JUL	.810 <T	.820 <T		
SEP	.140 <T	.110 <T		
NOV	1.200	1.100		
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)
JAN	25.000	23.000		
MAR	22.000	22.000		
MAY	24.000	22.000		
JUL	24.000	25.000		
SEP	23.000	23.000		
NOV	22.000	22.000		
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)
JAN	25.000	26.000		
MAR	37.000	36.000		
MAY	110.000	100.000		
JUL	46.000	42.000		
SEP	27.000	45.000		
NOV	24.000	27.000		
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)
JAN	BDL	BDL		
MAR	BDL	BDL		
MAY	.090 <T	BDL		
JUL	.070 <T	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
COBALT (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A
JAN	.100 <T	.100 <T		
MAR	.030 <T	BDL		
MAY	.110 <T	.090 <T		
JUL	.070 <T	.050 <T		
SEP	.160 <T	.060 <T		
NOV	.180 <T	.110 <T		
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)
JAN	.680 <T	BDL		
MAR	3.500 <T	3.300 <T		
MAY	4.100 <T	3.700 <T		
JUL	2.900 <T	2.600 <T		
SEP	.640 <T	4.100 <T		
NOV	.710 <T	1.300 <T		
COPPER (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)
JAN	19.000	1.400 <T		
MAR	22.000	1.600 <T		
MAY	13.000	1.300 <T		
JUL	10.000	3.800 <T		
SEP	16.000	3.000 <T		
NOV	29.000	1.700 <T		
IRON (UG/L)			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)
JAN	83.000	BDL		
MAR	36.000 <T	BDL		
MAY	14.000 <T	BDL		
JUL	9.900 <T	BDL		
SEP	12.000 <T	BDL		
NOV	38.000 <T	BDL		
MANGANESE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)
JAN	6.400	.430 <T		
MAR	3.200	.610		
MAY	2.000	.310 <T		
JUL	1.700	.280 <T		
SEP	1.200	.300 <T		
NOV	2.700	.690		
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A
JAN	1.200	1.300		
MAR	1.100	1.200		
MAY	1.200	1.300		
JUL	1.300	1.200		
SEP	1.200	1.200		
NOV	1.200	1.300		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)
JAN	1.600 <T	1.200 <T		
MAR	BDL	BDL		
MAY	.640 <T	.570 <T		
JUL	.590 <T	.240 <T		
SEP	.600 <T	.760 <T		
NOV	1.600 <T	.440 <T		
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)
JAN	.810	.150 <T		
MAR	.400 <T	.130 <T		
MAY	.190 <T	.070 <T		
JUL	.720	.410 <T		
SEP	.130 <T	.250 <T		
NOV	.390 <T	.170 <T		
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)
JAN	.570	.480 <T		
MAR	.550	.590		
MAY	.500 <T	.500 <T		
JUL	.400 <T	.320 <T		
SEP	.730	.660		
NOV	.560	.620		
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)
JAN	1.100 <T	BDL		
MAR	BDL	BDL		
MAY	1.600 <T	BDL		
JUL	BDL	BDL		
SEP	1.400 <T	2.000 <T		
NOV	BDL	BDL		
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A
JAN	190.000	190.000		
MAR	160.000	170.000		
MAY	180.000	180.000		
JUL	190.000	190.000		
SEP	190.000	190.000		
NOV	180.000	180.000		
TITANIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = N/A
JAN	4.500 <T	3.000 <T		
MAR	6.000	3.600 <T		
MAY	6.900	7.000		
JUL	9.000	9.500		
SEP	2.900 <T	4.100 <T		
NOV	2.300 <T	2.500 <T		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
THALLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 13 (D4)
JAN	BDL	BDL		
MAR	BDL	BDL		
MAY	BDL	.070 <T		
JUL	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		
URANIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (A1)
JAN	.350 <T	.340 <T		
MAR	.320 <T	.320 <T		
MAY	.330 <T	.320 <T		
JUL	.310 <T	.260 <T		
SEP	.270 <T	.270 <T		
NOV	.300 <T	.340 <T		
VANADIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A
JAN	.380 <T	.500 <T		
MAR	.340 <T	.400 <T		
MAY	.230 <T	.290 <T		
JUL	.240 <T	.240 <T		
SEP	.320 <T	.240 <T		
NOV	.240 <T	.220 <T		
ZINC (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 5000 (A3)
JAN	3.900	1.800 <T		
MAR	5.700	1.600 <T		
MAY	2.600	1.900 <T		
JUL	2.300	1.700 <T		
SEP	1.700 <T	1.900 <T		
NOV	3.500	2.000 <T		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
CHLOROAROMATICS			
HEXACHLOROETHANE (NG/L)		DET'N LIMIT = 1.000	GUIDELINE = 1900 (D4)
JAN	BDL	BDL	
MAR	BDL	BDL	
MAY	BDL	BDL	
JUL	BDL	BDL	
SEP	BDL	BDL	
NOV	BDL	3.000 <T	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
PESTICIDES & PCB			
ALPHA BHC (NG/L)		DET'N LIMIT = 1.000	GUIDELINE = 700 (G)
JAN	2.000 <T	2.000 <T	
MAR	1.000 <T	2.000 <T	
MAY	1.000 <T	BDL	
JUL	1.000 <T	2.000 <T	
SEP	1.000 <T	1.000 <T	
NOV	2.000 <T	1.000 <T	
ATRAZINE (NG/L)		DET'N LIMIT = 50	GUIDELINE = 60000 (A2)
JAN	BDL	BDL	
MAR	BDL	BDL	
MAY	BDL	130.000 <T	
JUL	100.000 <T	100.000 <T	
SEP	110.000 <T	BDL	
NOV	BDL	BDL	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
PHENOLICS (UG/L)	PHENOLICS	DET'N LIMIT = .20	GUIDELINE = 2 (A4)
JAN	.400 <T	BDL	
MAR	.600 <T	.600 <T	
MAY	BDL	BDL	
JUL	BDL	.400 <T	
SEP	BDL	.600 <T	
NOV	.600 <T	.800 <T	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
VOLATILES				
BENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
JAN	!AR	BDL		
MAR	BDL	BDL		
MAY	BDL	BDL		
JUL	BDL	BDL		
SEP	BDL	.100 <T		
NOV	BDL	BDL		
TOLUENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 24 (A3)
JAN	!AR	.100 <T		
MAR	BDL	.050 <T		
MAY	BDL	BDL		
JUL	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)
JAN	!AR	BDL		
MAR	.100 <T	.150 <T		
MAY	.050 <T	.100 <T		
JUL	BDL	BDL		
SEP	BDL	.050 <T		
NOV	BDL	.050 <T		
O-XYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 300 (A3*)
JAN	!AR	BDL		
MAR	BDL	BDL		
MAY	BDL	BDL		
JUL	BDL	BDL		
SEP	BDL	.050 <T		
NOV	BDL	BDL		
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)
JAN	!AR	.100 <T		
MAR	.150 <T	.200 <T		
MAY	.100 <T	.100 <T		
JUL	BDL	BDL		
SEP	.100 <T	.150 <T		
NOV	.100 <T	.100 <T		
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)
JAN	!AR	5.800		
MAR	BDL	5.800		
MAY	BDL	6.000		
JUL	BDL	8.900		
SEP	BDL	6.000		
NOV	BDL	4.500		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM METRO TORONTO (R. C. HARRIS WTP) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED		
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)
JAN	!AR	6.200		
MAR	BDL	6.150		
MAY	BDL	5.800		
JUL	BDL	6.900		
SEP	BDL	6.650		
NOV	BDL	5.250		
CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)
JAN	!AR	4.100		
MAR	BDL	3.600		
MAY	BDL	3.100		
JUL	BDL	3.600		
SEP	BDL	3.900		
NOV	BDL	3.100		
BROMOFORM (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (A1+)
JAN	!AR	.600 <T		
MAR	BDL	.600 <T		
MAY	BDL	.400 <T		
JUL	BDL	.400 <T		
SEP	BDL	.600 <T		
NOV	BDL	.600 <T		
1,4 DICHLOROBENZENE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 5 (A1)
JAN	!AR	.100 <T		
MAR	BDL	BDL		
MAY	BDL	BDL		
JUL	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		
TOTAL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)
JAN	!AR	16.600		
MAR	BDL	16.150		
MAY	BDL	15.400		
JUL	BDL	19.800		
SEP	BDL	17.100		
NOV	BDL	13.450		

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL
This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: P0C0D0 UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:**NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled

Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)
Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top

<u>Steps:</u>

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

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